

# Portable Ground Penetrating Radar for Airfield Evaluation

*A Research Effort of the United States Air Force Research Laboratory  
Airbase and Environmental Division (AFRL/MLQC)*

## OBJECTIVE AND GOALS

AFRL/MLQC is developing a man-portable ground penetrating radar (GPR) technology to provide an expedient yet thorough means of assessing the condition of airfields at deployment locations. The technology must be capable of evaluating pavements with varying layer thicknesses and material types. The technical challenges include:

- Minimizing system weight,
- Providing multi-frequency capability in a single hardware package, and
- Providing an automated data analysis system that can provide real-time results.

## APPROACH

The most commonly used equipment for contingency airfield evaluation is the dynamic cone penetrometer (DCP). This effort integrates the continuous GPR data and the DCP test

results at discrete locations. In this way, the GPR data can be calibrated to the well-established DCP test procedures and results in order to provide a more complete description of the structural condition of the airfield. The automated data analysis system incorporates data from both devices and provides the operator with real-time results which do not require an expert to interpret. The GPR data is interpreted by a neural network trained with data sets representing a wide range of conditions.

## RESEARCH PRODUCTS

This project develops a state-of-the-art portable GPR system for rapidly performing airfield pavement evaluation. The lightweight system is designed to be man-portable and self-supporting. This allows it to be used in contingency situations and in remote locations. The system consists of lightweight hardware and an automated data analysis system in order to provide real time results in the field.

A unique capability of the portable GPR system is the multi-frequency single-unit antenna. This allows the system to operate over a wide range of frequencies. The multi-frequency capability is required for a system that must evaluate airfields with a wide range of pavement thicknesses and material types. The radar transmitter operates in the frequency range between 500 and 2000 MHz, with a variable pulse width throughout this range. The antenna, radar controller, and transceiver are integrated with a portable computer which functions as the user interface and data analysis system.

## PAYOFF

The portable GPR system will enable combat control or other first-in personnel to perform more thorough airfield evaluations. The portable GPR system affords the user the opportunity to collect continuous information about the subsurface structure along the entire length of an airfield. This is opposed to current criteria and evaluation equipment, which allow the user to only collect data at discrete locations. A long-term goal is to couple the portable GPR system with several other nondestructive tests in order to develop a more complete picture of the subsurface conditions of the airfield.

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